PATENT SPECIFICATION

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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements relating to Compressor Driven Refrigerating Units for Air Conditioning Plants

I, ITALO PELLIZZETTI, an Italian Citizen, of 56, Corso Bramante, Turin, Italy, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to refrigerating units for air-conditioning plants e.g. for use in motor vehicles. The invention is particularly applicable to units of the type powered by a compressor which is driven by a variable speed motor, the power of which increases with the number of revolutions.

In known units of this type employed in air-conditioners for motor vehicles, the compressor is driven by the motor vehicle engine through an electromagnetic friction clutch which is controlled by a pressostat responsive to the delivery pressure of the compressor, this latter pressure matching the pressure in the unit condenser.

The pressostat is so set that when the pressure in the condenser exceeds a maximum admissible operating value, the pressostat operates the electromagnetic friction clutch to the compressor. Under certain conditions, for instance when the vehicle is moving slowly or stopping frequently, as in city traffic, and the pressure in the condenser reaches its maximum admissible operating value, the pressostat declutches the friction clutch and stops the compressor. In this way the refrigerating unit is liable to be inactivated at a time when it is most needed.

Subsequently, as the pressure sinks to a value below the maximum value, the pressostat causes the friction clutch to be recoupled and the compressor is again connected to the motor vehicle engine.

Considerable energy is however required to re-start the compressor as energy is needed both for overcoming the passive resistance and inertia of the halted compressor and for compressing the refrigerating fluid. If the motor vehicle engine is idling at the time of re-starting the compressor, as for instance when the vehicle is at standstill with its engine running, the engine is liable to stall as such coupling of the clutch takes place.

It is an object of the present invention to overcome such disadvantages as this.

Accordingly, the present invention consists in a compressor driven refrigerating unit for an air-conditioning plant, comprising a compressor, a condenser and an evaporator, wherein a valve is interposed between the evaporator and compressor, a valve member of which valve is arranged to be controlled by the pressure of the refrigerating fluid on the delivery side of the compressor so as to reduce delivery of the refrigerating fluid from the evaporator to the compressor when the pressure on the said delivery side of the compressor exceeds a maximum admissible operating value.

In use, therefore, the said valve is normally open and, when the pressure on the delivery side of the compressor exceeds its normal operating value, it throttles the passage for the refrigerating fluid flow. The refrigerating plant is thus brought to a changed condition of equilibrium with a reduced delivery and lower power absorption from the engine.

In order that the invention may be more readily understood reference will now be made to the accompanying drawing which is given by way of example and in which there is shown diagrammatically a refrigerating unit for an air-conditioning plant according to the invention.

The refrigerating unit will be seen to comprise a compressor 1, the delivery side 1A of which is connected to a condenser 2 and the

[Price 4s. 6d.]

suction side 1B of the compressor 1 is connected to an evaporator 3. The refrigerating fluid is conveyed in a closed circuit from the compressor 1 to the condenser 2, thereafter to the evaporator 3 and finally back to the compressor 1. As shown, this conveyance is *via* three sections of piping 10 which are arranged to connect the delivery side of the compressor to the inlet of the condenser, the outlet from the condenser to the inlet of the evaporator and the outlet from the evaporator to the suction side of the compressor.

A valve 4 is interposed in the section of the piping 10 between the compressor 1 and the evaporator 3, the casing 5 of this valve being provided with an inlet 5A and an outlet 5B, connected with the outlet from the evaporator 3 and the suction side 1B of the compressor 1, respectively. A passageway 8 is formed in the valve 4 between the inlet and outlet 5A, 5B, respectively, and the effective size of this passageway is controlled by a valve member in the form of a movable disc 6 which co-operates with a conjugated seat 7 formed in the casing 5 adjacent the inlet 5A.

The valve member 6 is fixedly secured to the end of a stem 11 which carries at its other end a piston 12 which is sealingly slidable in a cylindrical bore formed in the casing 5. In this way there is formed in the valve bore a variable volume chamber 13 and this is connected, through a branch pipe 14, to that section of the piping 10 which connects the delivery side 1A of the compressor to the condenser 2.

The face of the piston 12 remote from the chamber 13 is so biased by a cup spring 9 as to urge the piston 12 towards and into a position in which the valve member 6 opens the passageway 8, that is to say a position wherein the valve member 6 is spaced apart from the seat 7. The load of the spring 6 equals the force which will be exerted on the piston 12 by the maximum admissible operating pressure of the refrigerating fluid in the chamber 13. Thus, when the pressure in the chamber 13 exceeds this maximum operating value, the piston 12 is moved to the left of the illustrated arrangement against the action of the spring 9 and, in so doing, displaces the valve member 6 towards and onto its seat 7 so as to throttle the flow of the refrigerating fluid through the passageway 8.

In use, when the pressure of the refrigerating fluid on the delivery side 1A of the compressor 1 is lower than the maximum admissible operating value, the action of the spring 9 holds the valve member 6 in the fully open valve position, so that the passageway 8 is fully open. When an overpressure arises on the compressor side 1A, due to overheating of the refrigerating fluid, the pressure in the chamber 13 rises. If the said pressure exceeds the maximum admissible operating value, the piston 12 is displaced to the left and the cross sectional area of the passageway 8 is reduced accordingly by the member 6. The flow of the refrigerating fluid through the valve 4 is thereby controlled in dependence upon the delivery pressure of the compressor.

A secondary passageway 15 is bored in the seat 7 of valve 4, this passage being of small cross sectional area as compared with the passageway 8. The existence of the passage 15 allows refrigerating fluid to flow through the valve at a reduced rate when the valve member 6 is closed against its seat 7. Thus, even in the closed valve condition the arrangement allows expansion of the refrigerating fluid residual within the compressor. This arrangement damps down hammering of the oil in the compressor and avoids overheating.

It is of course equally convenient for the secondary passageway to be formed in the valve member 6 or even in both the valve member 6 and its seat 7.

As a result of such construction, a unit according to the invention will function efficiently even under conditions in which units of conventional type would be inoperative or at least inadequate.

Various modifications of the invention are of course possible within the scope of the appended claims.

WHAT I CLAIM IS :—

1. Compressor driven refrigerating unit for an air-conditioning plant, comprising a compressor, a condenser and an evaporator, wherein a valve is interposed between the evaporator and compressor, a valve member of which valve is arranged to be controlled by the pressure of the refrigerating fluid on the delivery side of the compressor so as to reduce delivery of the refrigerating fluid from the evaporator to the compressor when the pressure on the said delivery side of the compressor exceeds a maximum admissible operating value.

2. Unit as claimed in claim 1, wherein the valve member is operated by a spring-biased piston which is sealingly slidable, in a chamber formed in the casing of the valve, between a valve opening position wherein the cross sectional flow area through the valve is unhindered, and a valve closing position wherein the valve member throttles the flow passage, the spring holding the piston in the former said position in opposition to the pressure of fluid in the valve chamber until the said pressure exceeds the maximum admissible value.

3. Unit as claimed in claim 2, wherein the chamber is connected with the compressor delivery, the spring being pre-set in dependence upon the maximum admissible

operating pressure dictated by or chosen for the unit.

4. Unit as claimed in claim 2 or 3, wherein a secondary small section passage is bored in the valve member or the seat therefor or in both the member and the seat to allow the refrigerating fluid to flow through the valve at a reduced rate in the closed condition of the valve.

5. Refrigerating unit substantially as hereinbefore described with reference to the accompanying drawing.

J. MILLER & CO.,
Agents for the Applicant,
Chartered Patent Agents,
John Kirk House,
31-32 John Street,
London, W.C.1.

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1 SHEET

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.